The Electrical Age.

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INDEX TO ADVERTISERS.

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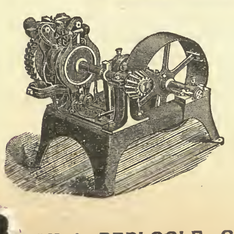

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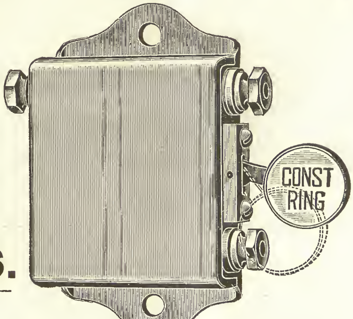

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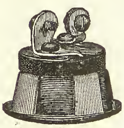

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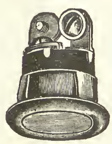

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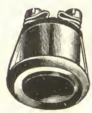

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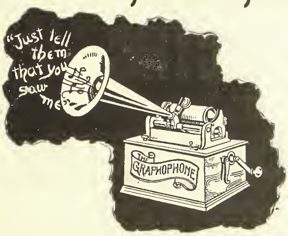

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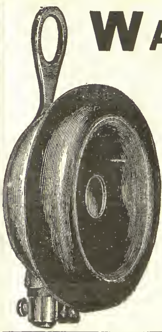

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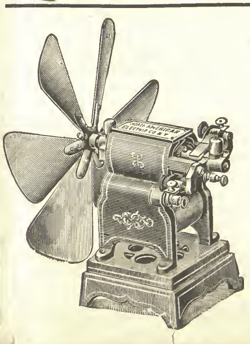

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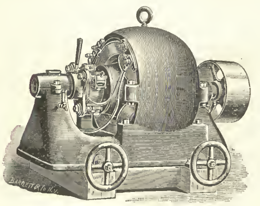

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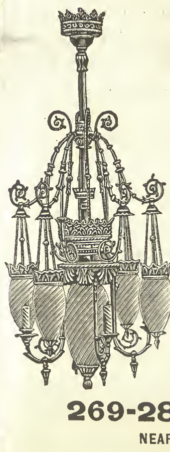

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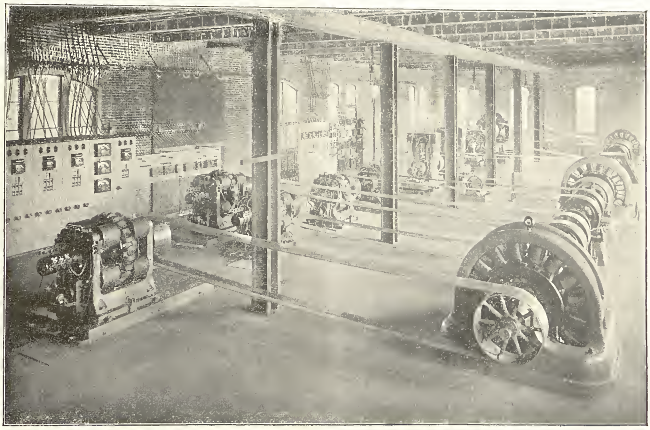
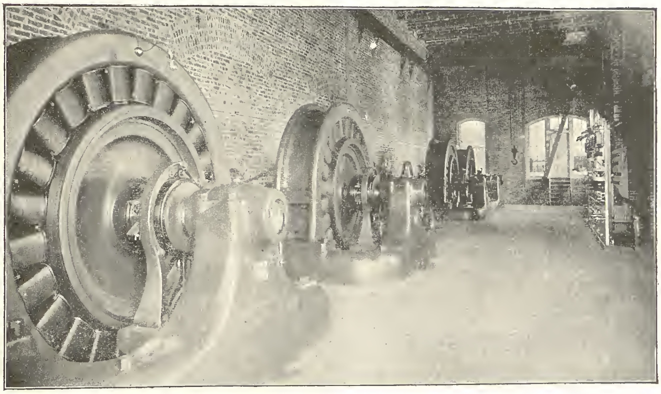


SUB-STATION AT SACRAMENTO.



DYNAMO ROOM AT FOLSOM.

A MODEL TRANSMISSION PLANT.

The completion of the power transmission scheme between Folsom and Sacramento is the conclusion of a vast enterprise undertaken in doubt and terminated in a success which has, as it were, galvanized the State of California, and demonstrated not only the tremendous resources at its command, but also the feasibility of electrical transmission over long distance commercially.

The scheme as first conceived by Mr. Livermore, president of the Natona Water and Mining Co., contemplated nothing more than the building of a dam across the American River at Folsom for the storage of water and the irrigation of lands lying in the Sacramento Valley. For twenty-five years intermittent efforts were made to carry out the scheme, and but little progress was effected. Calculations had also been made looking to the utilization of the power derivable from the difference in level of the water, and estimates had placed the possible power available at Folsom extremely high, while dreams of a huge

manufacturing city to utilize this power at that point were indulged in; but the result turned out differently, and instead of the factories being brought to the power, the power is now taken to the factories.

4,000 feet long and, on the completion of this, the terms of the state labor contract were fulfilled. Thus far the canal is built along the face of the cliff. The third section of the canal is an earth ditch, excavated by the Fol-

STEP-UP THREE-PHASE TRANSFORMERS AT FOLSOM.

In 1881 the rights of the old company, presided over by Mr. Livermore, were taken over by the Folsom Water Power Co.; work had been begun on the dam, but the development of the scheme appeared so costly that not until

som Water Power Co., and is 3,000 feet long. The outer wall of sections two and three carries a broad gauge railroad track.

The total length of the canal is 9,500 feet. Section 1

STEP-DOWN TRANSFORMERS AT SACRAMENTO.

the company made a contract with the State of California, whereby convict labor for the construction of the dam and canal was exchanged for the site of a state prison and a certain amount of power, was work really put under way. In 1886 this contract was signed, the plans were expenaded, and under these new plans work was begun in earnest.

The dam is a massive structure of granite laid in Portland cement. It is 650 feet long, 89 feet high in the centre, 87 feet wide at the base, 25 feet wide at the crest and contains about 48,590 cubic yards of solid masonry. It is provided with a heavy wooden shutter or flashboard six feet high, which at high water is lowered into a recess in the crest of the dam. At low water this shutter is raised by hydraulic pistons, the depth of the basin is increased by six feet, and additional storage capacity provided. Normally the dam forms a storage basin or reservoir three and one-half miles long with a capacity of 13,000,000 cubic yards of water.

At each side of the dam are massive granite bulkheads and three head gates, operated by hydraulic machinery; each headgate is 16 feet wide. The canal on the west side, intended principally for irrigation, is not yet completed.

The east side canal is divided into three sections. The first stretching as far as the state canal, where the water falls about seven feet, is cut out of solid granite and extends a distance of 2,000 feet. The second section is

is 53 feet wide on top and 45 on the bottom. Sections 2 and 3 are each 50 feet wide on top and 40 feet on the bottom. The depth is eight feet. All the water passes through the State Power House, through Leffel turbine wheels, developing some 800 H. P., used for air compressors, electric lighting and other purposes. Thence the water continues on to the Folsom Power House, at the side of which is an immense log basin. Here the jurisdiction of the Folsom Power Co. ceases, and that of the Sacramento Electric and Power Co. begins.

The power house is built on the site of an old placer gold mine, where a fall of 55 feet is available at high water. It is on the west side of the town of Folsom in a cut about 60 feet deep, 100 feet wide, and 150 feet long, from which a channel 40 feet wide leads down to the river. At the power house the canal makes a sharp turn at right angles and widens out into a fore bay 150 feet long, 100 feet wide and 12 feet deep, which forms a settling basin for debris. It is divided into two parts by a stone wall provided with suitable gates, so that one side may be cleaned out while the other is in operation. At the lower end of each section of the bay a sluicing gate connects with the lower river by a sluicing canal, and through this the sand and debris are carried away and kept from the wheels. The hydraulic apparatus, manufactured by S. Morgan Smith, of York, Pa., consists of four pairs of 30-inch wheels of the McCormick horizontal shaft turbine type, each pair of 1,260-H. P. capacity at 300 revolutions

operating under a head of 55 feet. The steel penstocks are eight feet in diameter, and each wheel has two draft tubes. The governors are of the Faesch-Picard type, and these are assisted by heavy fly-wheels fitted to the water-wheel shafts. The hydraulic plant also includes two special horizontal wheels for the exciters. The water, after having passed the turbines, is discharged into a tail, race canal, which will distribute water for irrigation over the country south and west of Folsom.

The power house is a two-story brick building. The water-wheels are placed in the open air between the fore-bay and the wall of the structure, through which the turbine shafts pass. To each shaft is coupled a 750 K. W. (100 H. P.) General Electric three-phase generator —the largest of their type yet constructed. Each is a 24-pole machine delivering current at 60 cycles 800 volts, and running at 300 R. P. M. The exciters are 4-pole, 500-volt, 30-K. W. generators, either one of which is of sufficient capacity to excite the fields of all four generators. From the generators the current passes to the generator switchboard, and thence to nine step-up transformers in the upper story of the power house. The capacity of each transformer is 250 K. W. They are cooled by an air-blast from blowers driven by inductive motors. In these transformers the pressure is raised from 800 volts to 11,000 volts, and the current passes to the high tension transmission lines carried out of the power house through porcelain-lined holes in the wall.

The switchboards are of Tennessee marble, and are so arranged that the generators may be run in parallel or on separate lines as may be desired. The generator swithboard carries the necessary switches, instruments and other apparatus for synchronizing the generators. The boards in the transformer room carry switches for the high and low tension sides of the transformers and switches, and current indicators for the transmission lines.

The pole line is double throughout, and follows the highroad from Folsom to Sacramento, a distance of 24 miles. Each pole carries two cross-arms for two circuits, each circuit consisting of three bare copper wires supported on double-petticoated porcelain insulators, especially designed and made for this installation at the porcelain factory of the General Electric Company at Schenectady. Each insulator before shipment was exposed to a test of not less than 25,000 volts alternating. Each circuit can carry the output of one dynamo, and any dynamo can be drawn on any line. The loss is calculated 7.2 per cent. when transmitting 3,000 H. P.

The telephone line is carried on the same poles as the transmission line and connects the power house with the sub-station in Sacramento. The transmission lines being spiralled every mile, and the telephone wire transposed every fifth pole, no induction is noticeable on the telephone circuits and conversation is not in any way interfered with.

The sub-station is a fireproof two-story brick building on the corner of Sixth and H Streets, Sacramento, having the transformers on the second floor and the dynamo room on the ground floor. In the transformer room the high tension switchboards receive the terminals of the 10,000 volt lines and operate the different combinations of the step-down transformers. These transformers, also ventilated by blowers, vary in size according to the duty required of them, the secondaries delivering current at 125, 500 and 1,000 volts. They number twenty-one; fifteen of 125 K. W. and six of 40 K. W.

The transformers are connected to high and low tension switches on the boards, and from these the current passes to the distributing boards for the synchronous motors, power circuits and incandescent lighting.

In the main or dynamo room of the sub-station a line shaft runs the entire length. To this are directly coupled, through friction clutches, three synchronous motors, each of 250 K. W. capacity, wound for a potential of 500 volts and run at a speed of 450 revolutions. To the line shaft are belted one 200-K. W., and one 90-K. W. multipolar G. E. railway generators and two 100-K. W. Edison bipolar machines, all of 500 volts, and three 100-light and two 75-light Brush arc machines.

In this room are also the switchboards for controlling the synchronous motors, the railway generators and circuits and the arc dynamos.

For the operation of the synchronous motors 750 K.W. of transformers capacity is utilized, the remainder being used for low and high tension distribution. The low tension current is distributed by a three-phase, four-wire system combining the three-phase and Edison three-wire system, i. e., three wires for the three-phase current and a fourth or neutral wire. Incandescent lights are connected between the neutral and any one of the three other wires, while motors are connected to the three-phase wires, giving at the mains 115 volts for lamps and 200 volts for motors. The feeders for this extensive system pass from the sub-station through a distributing switchboard, which carries potential regulators for maintaining constant pressure at the mains. Additional circuits run from the sub-station at 500 and 1,000 volts, supplying current for lights and motors in the more distant parts of the city.

Power was transmitted for the first time from Folsom to Sacramento on July 14, 1895, for the operation of the Sacramento street railway. On September the 9th, a grand carnival was held to celebrate what up to the present is the longest commercial power transmission ever effected. The remainder of the machinery has since been set up and the installation is now complete.

The power transmitted is now being used for manufacturing purposes, as well as for lighting the city and running the street railway. The power is much cheaper than that by steam, and it is interesting to note that the steam-engine is fast disappearing from Sacramento factories. Among the establishments now using the power are flour mills, box factories, machine shops and hotels.

The largest consumer is the street railway, which over 24½ miles of single and 17 miles of double track operates 32 motor cars and trailors. The Southern Pacific Railway shops employ a large number of motors for drawbridges and elevators in freight sheds. The Buffalo Brewing Company is about to install five non-synchronous motors to replace steam-engines which have been in use for years, and expect to save 40 per cent. of the present cost of operation by the change.

The entire equipment was carried out by the General Electric Co., whose apparatus is exclusively employed.

This plant is a complete illustration of the possibilities of electrical transmission, every problem to be met with in transmitting power over long distances at high potentials and utilizing it having been solved successfully.

The best indication of this success is reflected in the value of the interest-paying obligations, the bonds of the Sacramento Electric Light and Power Co. finding ready purchasers at par, although the plant has been in operation less than one year.

THE GOLD PRODUCT.

It is now evident that the production of gold for the next 50 years will be altogether unprecedented. This production has been vigorously stimulated by fresh discoveries of mines, by new and cheap mining processes and by the fall of silver, leading miners to pay greater attention to the other metal. The operation of the latter factor is best seen in Colorado, where the production of gold rose from \$5,300,000 in 1892, to \$7,527,000 in 1893, and to about \$12,000,000 in 1894. The production of 1895 in Colorado is confidently expected to reach \$20,000,000. The director of the mint is of the opinion that the production of the United States rose from \$33,014,981 in 1892 to about \$39,500,000 in 1894, while other good authorities put the production of 1894 at \$50,000,000. The annual report of other great producing coun-

tries shows a large increase of late years. In his notable article in the "North American Review," Mr. Preston states that the world's production of gold for 1893 was the "largest in history, amounting in round numbers to $155,522,000." The product of 1894, however, very largely exceeded—probably by 25%—the product of 1893. There is scarcely any assignable limit to the gold known to exist in the world, or even in the United States. It is said that simply by the removal of the restrictions on hydraulic mining California can produce half a billion of of gold. The quantity easily obtainable in Colorado is stupendous. Other parts of the United States are also rich, while Australia and Russia probably possess a stock equal to our own and are increasing the annual output every year.

But the most surprising, and, so to speak, revolutionary facts regarding gold that have recently come to light are those concerning the great Witwatersrandt mines of South Africa. There the gold is found in enormous quantities and in a cheaply workable form in a new geological situation—"in strata the component parts of which are pieces of quartz held together by a clayey cement."—Popular Science.

WHAT ELECTRICITY WOULD SAVE.

An expert on the application of electricity as a motive power in railroading not long since furnished an interesting series of articles on the subject, concluding with an estimate of what it would cost to furnish the Pennsylvania Railroad with an electrical equipment. There were four methods to determine the amount of power required, but the most accurate was taken as a basis. This was done by taking the coal consumption and assuming a certain consumption per horse-power hour. This gives 147,573 horse-power required. This estimate is taken as a basis, and 25% is added to allow for increased traffic at certain seasons of the year, and again 25 % to cover the heaviest demands during the day at such times. The grand total is 230,585 horse-power. As this is the amount estimated as required delivered on the track, it is considered necessary to have 385,000 horse-power in the power stations.

The plan of estimate then divides the line into 60 sections of 45 miles of road and gives each section a power plant of 6,500 horse-power each. The total cost for the 60 stations is given at $37,620,000. The cost of 1,000 motors to take the place of 1,800 engines is added and the cost of the total electrical equipment of the system amounts to $43,620,000. The author says: "This estimate is only a rough approximation; anything more in detail or more accurate could not be given unless we had full information as to amount of traffic over each mile of road, location of curves, grades, etc.," but also adds that the figures "are undoubtedly much nearer to the actual cost than a mere good guess, and enables us to form some idea of what the transformation of a large trunk line railway system from steam to electricity would involve in the way of expenditures."

The cost of operation of this plant is estimated carefully at $2,724,800, and subtracting this from the saving in operating expenses already given at $7,606,442.24, the net annual saving is $4,881,642.24, or more than 11% on the total cost of the installation.

This is certainly a great showing for electricity. If the new power would save 16.4% of the operating expenses on the Pennslyvania Railroad, it should surely be adopted. As the expert referred to says himself, if railroad managers were convinced that these claims are true, a transformation of their lines would at once be undertaken; but they are not convinced, and will not be until they learn the facts in their own way, and that way will be by going slowly and trying a branch road here and another there until they have obtained a sufficient amount of data from actual experience to dispel all doubt. Then steam may disappear from the railroads and the adoption of electricity be as general and rapid as it has been on the street car lines. Already several railroads are feeling their way by experimenting on branch roads with light equipments. This work will no doubt be followed up by the equipment of more important branches with heavier rolling stock, until a sufficient amount of practical data is obtained to justify a change of entire systems. —American Manufacturer.

INQUIRY COLUMN.

In this column we shall endeavor to answer all questions relating to the science of electricity that may arise in the minds of our subscribers.

(Q.)—ELECTRIC CARRIAGE.

Brooklyn, N. Y., Aug. 18, 1896.

To Editor Electrical Age.

Dear Sir:—Being asked the question of what is required to run an electric carriage that needs 300 watts to run it; what size motor, connections, etc., are required; in fact, let me know all there is about it and oblige a subscriber. H. A. R.

(A.)—A ½-HP. motor takes a little more than 300 watts. To start a carriage more force must be exerted than is required to run it; so at least a 1-HP. motor would be necessary. The connections are the same as those of any other motor, a starting box being required. The power applied is generally obtained from storage batteries. To tell you all about it would be embarrassing to others desiring to use this column. A paper called "The Horseless Age," might give you a more elaborate and detailed account.

(Q.)—150-HOUR ARC LAMPS.

Newark, Aug. 12, 1896.

Electrical Age Publishing Co.

Dear Editor:—The long life of carbons used in the new closed globe lamps are interesting to me in this respect: I would like to know why they burn so long and where the advantage otherwise lies. Yours truly,

L. W. Cartwright.

(A.)—The carbons start an arc in a closed globe. The arc quickly burns up the oxygen; the carbon being intensely hot combines and forms an oxide. The carbons, therefore, are protected from oxygen from the outside and only wear away due to the influence of the arc upon them. This wasting away is very gradual; hence the long life. Not only is carbon saved, but labor and some power, in certain cases. The gain is quite definite and in all probability this new form of lamp will be universally used in due time.

(Q.)—WATER FROZEN BY ELECTRICITY.

San Francisco, Cal., Aug. 2, 1896.

Electrical Age.

To the Editor:—Can water be possibly frozen by electricity? Kindly oblige a constant reader.

Frank A. Martens.

(A.)—Water can be frozen by electricity in two ways: 1st. By applying a motor to an ice-cream freezer, filling it (the freezer) with water; 2d. By experimenting with two dissimilar metals, joined, through which a current is passed. One junction, if the series is large, will heat; the other, cool. Water has been well frozen by this means.

(Q.)—DYNAMO SPARKS.

Albany, N. Y., July 15, 1896.

Editor Electrical Age:

Dear Sir:—Can you give me any assistance in stopping the sparking at the bushes of my dynamo. The machine is about three-quarters loaded when the sparking becomes very violent. I have tried everything without success. Kindly let me know at once.

Yours very truly, John Maguire.

(A.)—Try to reduce the sparking by shifting the brushes. If this is ineffectual strengthen the field, because the armature reaction is probably the cause of it, and it will be diminished by this means. If the machine has not sparked always, the trouble is local—somewhere in the armature. Give it a thorough test and let us hear from you.

STANDARDS OF LIGHT.

PRELIMINARY REPORT OF THE SUB-COMMITTEE OF THE INSTITUTE.

(Continued from Page 442.)

BY EDWARD L NICHOLS, CLAYTON H. SHARP, AND CHARLES P. MATTHEWS.

Fig. 3 shows the curves given by the English standard candles. In curves III. and IV. the candles were lighted at their tops. The wicks flared up and gave a high point on each curve, which in the case of curve IV. is not shown on the plate. The flames then increased gradually to their normal size, which was reached after about 15 minutes. Curves III. (*a*) and IV. (*a*) are continuations of III. and IV. The candles were allowed to burn during the interval between the curves, which in the case of III. and III. (*a*) was 45 minutes, and in the case of IV. and IV. (*a*) was 55 minutes. During III. the room was rather more draughty than during III. (*a*), and the effect of the draughts is seen in the much larger number of small irregularities in the former than in the latter curve. During the interval between IV. and IV. (*a*) the height of the flame of the candle was found to vary between 43 and 48 mm.

Curve I. was taken with the portion of candle left over from IV. and IV. (*a*). It was lighted, its wick being already charred and its crater formed, and readings were taken immediately. Curve II. was taken with the lower half of the candle used in getting III. and III. (*a*). The bottom, *i. e.*, the larger end of this, was hollowed out to expose the wick, and readings were taken after the candle had been burning long enough to come to its normal light-giving power. The agreement in the amount of radiation of the candle burned in this way, with the amount when burned from the smaller end, shows that the variation in the diameter of the candle has little if any influence on the intensity of the light emitted.

One marked peculiarity which characterizes, to a great-

TABLE II.

RESULTS OF BOLOMETRIC MEASUREMENTS (BRITISH CANDLE).

	Time: Minutes on curve.	Mean ordinates and their mean.	Deviations from the mean ordinate of the curve.	Deviations reduced to percentages.	Deviations from mean ordinate of all the English candle curves.	Deviations from general mean reduced to percentages
Curve I.	15-20	41.68	−10.4	−2.43	+0.59	+1.44
	20-25	44.68	+1.96	+4.58	+3.59	+8.72
	25-30	40.84	−1.88	−4.40	−0.25	−0.61
	30-35	43.39	+0.67	+1.57	+2.30	+5.59
	35-40	43.71	+0.99	+2.32	+2.62	+6.37
	40-45	42.04	−0.68	−1.59	+0.95	+2.31
		42.72	Correction for rate of burning = −0.70.			
Curve II.	45-50	39.24	−1.77	−4.32	−1.85	−4.50
	50-55	37.85	−3.16	−7.70	−3.24	−7.87
	55-60	39.12	−1.89	−4.61	−1.97	−4.79
	60-65	40.44	−0.57	−1.39	−9.65	−1.18
	65-70	40.76	−0.25	−0.61	−0.33	−0.80
	70-75	42.85	+1.84	+4.48	+1.76	+4.28
	75-80	43.52	+2.51	+6.12	+2.43	+5.92
	80-85	43.20	+2.19	+5.34	+2.11	+5.13
	85-90	42.11	+1.10	+2.68	+1.02	+2.48
		41.01	Correction for rate of burning = +0.05.			
Curve III.	15-20	43.04	−0.54	−1.25	+1.95	+4.74
	20-25	42.88	−0.70	−1.62	+1.79	+4.35
	25-30	42.82	−0.76	−1.76	+1.73	+4.21
	30-35	42.18	−1.40	−3.23	+1.09	+2.65
	35-40	43.23	−0.35	−0.80	+2.14	+5.20
	40-45	44.80	+1.22	+2.80	+3.71	+9.02
	45-50	43.58	0	0	+2.49	+6.06
	50-55	44.30	+0.72	+1.65	+3.21	+7.80
	55-60	45.38	+1.80	+4.13	+4.29	+10.45
		43.58	Correction for rate of burning = −0.34.			
Curve III. (*a*).	60-65	43.25	+0.23	+0.53	+2.16	+5.25
	65-70	43.52	+0.50	+1.16	+2.43	+5.91
	70-75	42.82	−0.20	−0.47	+1.73	+4.21
	75-80	43.68	+0.66	+1.54	+2.59	+6.30
	80-85	42.82	−0.20	−0.47	+1.73	+4.21
	85-90	42.04	−0.98	−2.28	+0.95	+2.31
		43.02	Correction for rare of burning = −0.34.			
Curve IV.	15-20	38.65	+1.42	+3.82	−2.44	−5.94
	20-25	39.84	+2.61	+7.01	−1.25	−3.04
	25-30	38.07	+0.84	+2.26	−3.02	−7.35
	30-35	35.76	−1.47	−3.87	−5.33	−12.95
	35-40	35.72	−1.51	−4.05	−5.37	−13.08
	40-45	37.04	−0.19	−0.51	−4.05	−9.84
	45-50	35.84	−1.39	−3.75	−5.25	−12.78
	50-55	37.16	−0.07	−0.02	−3.93	−9.55
	55-60	36.96	−0.27	−0.72	−4.13	−10.05
		37.23	Correction for rate of burning = +0.45.			
Curve IV. (*a*).	60-65	38.26	−1.47	−3.70	−2.83	−6.88
	65-70	39.04	−0.69	−1.74	−2.05	−4.99
	70-75	38.26	−1.47	−3.70	−2.83	−6.88
	75-80	40.84	+1.11	+2.80	−0.25	−0.62
	80-85	40.84	+1.11	+2.80	−0.25	−0.62
	85-09	41.16	+1.43	+3.60	+0.07	+0.17
		39.73	Correction for rate of burning = +0.45.			

Mean ordinate of all the English candle curves is 41.09.
Mean ordinate of all the English candle curves corrected for rate of burning is 41.05.
Mean ordinate of all the English candle curves corrected for rate and reduced to true deflections is 41.06.

er or less degree, all these curves, is the succession of sudden drops followed by gradual rises to a maximum In the case of the drop in curve IV. at 55 minutes, the change amounted to 15% of the total deflection, and in other instances the change was nearly or quite as large. The reason for these drops is to be looked for in the action of the wick, which, as the candle burns down projects farther above the spermaceti, causing a tall flame. Finally, by reason of charring and because of its own weight, it bends over and the end burns off. The flame following the wick becomes shorter.

Since the wicks of English standard candles are very uniform in construction, these drops succeeded each other after nearly regular time intervals of about 3 minutes.

A confirmation of these results, together with conclusive evidence of the legitimacy of the bolometric method of studying light sources will be found in section IV. of this report.

(To be continued.)

Recent Experiments in Acetylene.—H. Le Chatelier, a French chemist, in experimenting with acetylene, finds that mixtures with air are explosive when they contain more than 2.8 and less than 65% of acetylene, mixtures of acetylene and oxygen, when they contain more than 2.8 less than 93% of acetylene. The diameter of the tube from which it is ignited is commented upon. In tubes of less diameter than 40 mm. (1.57 ins.), these limits are gradually narrowed until in tubes of 0.5 mm. (0.02-in.) the propagation of the flame ceases altogether. In mixtures of air and acetylene, when the percentage of the latter is less than 7.7, the flame is yellowish-brown and feebly luminous, and the products of combustion are carbolic anhydride and water. When the percentage of acetylene is from 7.7 to 17.4, the flame is pale blue with a yellowish-brown edge, and carbonic anhydride, carbonic oxide and water are formed. Between 17.4 and 20% of acetylene cause very imperfect combustion, carbonic oxide, hydrogen, carbon and acetylene being residual products. When over 20%, the disposition of soot is very marked, and the flame, though strongly luminous, is of a reddish color. The rate of propagation of the flame is 0.1 metre (3.9 ins.) per second, with 2.9% acetylene, increases rapidly to 5 metres (197 ins.), slowly to 6 metres (236 ins.), with 9 to 10%, and then decreases rapidly to 0.4 metre (15.7 ins.) with 22%, and slowly to 0.5 metre with 64%. The temperature of ignition is very low, viz., about 480° C., most other combustible gases requiring 600° C. for ignition. The temperature of the flame is very high. Burned with its own volume of oxygen, acetylene gives a temperature of about 4,000° C., or about 1,000° C. more than the oxyhydrogen flame.

ROENTGEN RAYS.

New Incandescent Lamp.—A new filament for incandescent lamps has been described as made of hygroscopic asbestos paste which, after being made in sheets .3 mm. thick, is cut into strips 6 cm. wide, and impregnated with a 30% solution of platinum chloride. It is then passed through a saturated solution of sal-ammoniac, dried in hot air, and then heated in a Bunsen flame, which converts the platinum solution into a platinum sponge. It is further impregnated with a 20% solution of magnesium chloride and heated, which process is repeated until the plate is covered with a uniform coating of magnesia, and it is finally dipped into a 10% solution of cerite nitrate. The magnesium coating protects the platinum, and the light-radiating properties of the cerite metals are much greater than those of carbon.—American Manufacturer.

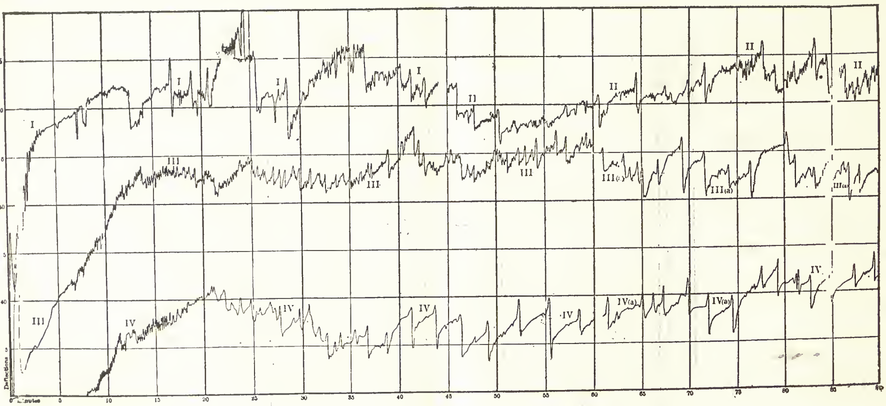


Fig. 3.

Forty-two Tons Pressure.—An experiment was recently made in Vienna in order to test the relative resistance, under pressure, of the hardest steel and the hardest stone. Small cubes of corundum and of the finest steel were subjected to the test. The corundum broke under the weight of six tons, but the steel resisted up to 42 tons. The steel split up with a noise like the report of a gun, breaking into a powder, and sending sparks in every direction, which bored their way into the machine like shot.—N. E. Lumberman.

—Few people have any idea of the wonderful amount of strength possessed by members of the beetle family. Felix Plateau has made experiments which show that a common dor beetle can draw 500 times its own weight, and a stag beetle has been known to escape from under a box weighted with a book 1,700 times greater in weight than the insect's body. If horse's strength was as great comparatively as that of a common flea he could draw a dead weight of 800,000 pounds.—N. E. Lumberman.

Gas Motor Cars in Berlin.—A gas motor car of the Dessau Gas Railway Company is now on exhibition in the German Industrial Exposition at Berlin, together with a portable gas compressing engine which furnishes compressed gas to run the car. Since May 1 a similar car is making regular daily runs on the street car line Charlottenburg-Knie and renders very satisfactory service.—American Manufacturer.

—The range of the human voice is quite astounding, there being about 9 perfect tones, but 17,592,186,044,515 different sounds; thus, 14 direct muscles, alone or together, produce 16,383; 30 indirect muscles ditto, 173,741,823, and all in co-operation produce the number we have named; and these independently of different degrees of intensity.—N. E. Lumberman.

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CONTENTS.

THE MODERN ALCHEMIST.

This is a very prosaic world. We believe in nothing that we consider incapable of proof. Yet the traditional and ancient spirit still prevails. Perpetual motion cranks are a drug on the market. The search after an elixir of life has not ceased. Again the wheel has turned and produced an old-time product, a transmuter of metals, a modern alchemist. Modern alchemists are as dangerous to-day as they were of old. They are prepared to conquer incompetent opposition by an array of so-called scientific evidence that cannot be refuted by the layman. His mixtures have names, his concoctions are embellished by unending formulae and his statements supported by the ordinary phenomena of nature. The public are helpless, their attacks fruitless, their opinions valueless. Dr. Emmens, of New York, claims to have discovered a process by which silver can be transmuted into gold. He cannot make public his processes now, but will say that the gold is dissolved in a liquid, as sugar into water. Let us wait. When the process is complete and the product marketable, our silver dollars will entirely disappear. Everybody will have gold. Owners of silver mines will change their faith. They may not know what to say. They might become ardent bimetallists. After silver has been turned into gold it will be a simple matter to change the other metals. The color of copper is much nearer to gold than silver, and the process may be more easily applicable. Does Dr. Emmens think he can turn brass into gold?

THE ELECTRIC LIGHT IN THE ARCTIC REGIONS.

The altar of ambition is heaped with human sacrifices. No more noteworthy example of the dangers through which an ambitious man will go is to be found than in the progress of Dr. Nansen towards the North Pole. A physical hardihood, a spirit of intrepidity is required which will outlive the gravest perils, the most frightful dangers and the most despairing of conditions. Dr. Nansen returned when within 250 miles of the pole. He had approached nearer to it than any living man. The great ice-barrier, and the absolute desolation would quickly unnerve any but an iron heart. There is in his journey's history a few facts of interest to ourselves. He attributes much of the comfort he found to the use of an electric current. A small outfit composed of windmill and dynamo was the means by which he lit the icy wastes and produced heat sufficient for his needs. The addition of a hand device enabled him at any time to drive the generator. A stranger sight we cannot imagine. Vast tracts of ice stretching for miles on all sides like a great winding sheet. A death-dealing coldness; this heroic man, his eyes fixed afar on the barren wastes, the interminable hummocks,the seemingly unending wilderness of snow and ice, struggling northward step by step. Dante has left untouched such frigid horrors. The garland of immortal fame is still secure. It rests as yet upon the broad bosom of the great ice king.

THE FUSIBILITY OF PLATINUM IN A CARBON FURNACE.

Victor Meyer, in the "Chemical News," remarks that it has been recently pointed out that the oft-repeated assertion of the fusibility of platinum in a furnace fed with carbon and air has not been incontrovertibly demonstrated. As the vessels used are in general more or less injured at the high temperature of the experiment, or cannot be considered as perfectly fitting, it is not impossible that the flames of the furnace or burning particles of carbon may come in direct contact with the platinum. But, as is well known, in almost every flame there is a hot region having a higher temperature than the melting point of platinum. A capillary platinum wire can be fused in the hottest part of the flame of a candle. The problem of fusing platinum in the carbon blast furnace in vessels perfectly closed on all sides does not seem to have been hitherto solved in a manner which excludes all doubt.

In the course of the pyro-chemical investigations which for some time have engaged Dr. von Rocklingshausen, Dr. Locke, and the author, they undertook the task, among other things, of obtaining a firebox in which platinum can be fused while an alloy of 25% iridium and 75% platinum remains unattacked. They needed such a firebox for determinations of the density of gases and measurements of temperature, which are undertaken with the apparatus made by Haeraeus of platinum-iridium. For this purpose they used a furnace quite similar to the blast furnace used by C. Langer although of larger dimensions, and provided with a larger wind chest. As fuel they used retort graphite, broken up in pieces of the size of a hazel nut. The air was supplied by a very powerful blast. Under certain conditions this furnace answered the purpose required, as was proved by the following experiment:

They found a block of perfectly refractory earth in which were two depressions, so that it might be regarded as a double crucible with very thick sides. In one of these depressions was laid a piece of sheet platinum, and in the other a sheet of metal of equal size of the alloy of 25 parts iridium and 75 platinum, which had previously been proved to be considerably less fusible than platinum. The block was then perfectly closed by means of a top of the same refractory earth, so that the whole formed a massive stone-like mass with two cavities. On burning, the crucible thus formed was converted into a stone per-

fectly solid and hard. After it had been heated in the above graphite blast furnace, and allowed to cool, it was broken open. The platinum was melted into a ball, but the platinum-iridium alloy was perfectly unaffected. Hence, it is claimed that now the fusibility of platinum in thick-sided crucibles with a carbon blast furnace is indubitably established.—American Manufacturer.

ALTERNATING CURRENTS.

LESSON LEAVES
FOR
THE AMERICAN SCHOOL OF ELECTRICITY.

BY NEWTON HARRISON, E. E.

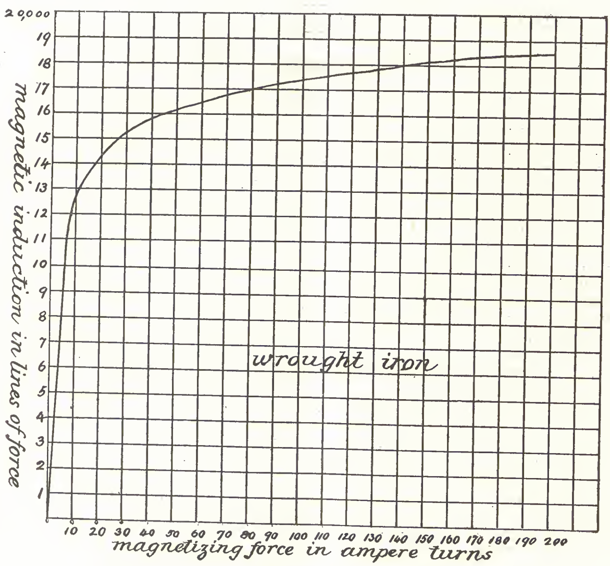
The different values of the current does not prevent the instrument maker from constructing meters which will measure the "square root of the mean square." The pulsations of an arc light current practically consist of a series of waves always passing onward in one direction but virtually similar in general appearance to an alternating wave. The rapidity with which a series of alternations pass back and forth is productive of several strange effects. A piece of metal of any description when thus influenced becomes warm and possibly very hot. When a coil of wire containing a core of iron is magnetized and demagnetized by an alternating current a peculiar hum is heard. The more rapidly the current reverses the louder the hum, until its resonant sound is like a low musical tone. The iron within the core will become very warm and have a curious effect upon a piece of metal placed near it, repelling it with considerable force and likewise exciting heat in it. The explanation given of the effect produced in iron is twofold.

First: It is observed that the magnetization consumes power. A piece of iron magnetized by a current flowing in one direction will consume more power to bring it back again to a neutral condition than it did in becoming magnetic. This consumption of power is called *hysteresis*, and is due to a certain molecular condition causing a rigidity of the particles and therefore depending upon the quality of the iron for its extent. A piece of steel would consume more power than soft wrought-iron while undergoing the process of magnetization and demagnetization; a well annealed piece of iron, less than the ordinary wrought-iron not treated in this manner. Mr. Kapp has given figures on the amount of energy consumed in a mass of iron by hysteresis. The reversals occurred 100 times per second, giving 200 changes. These results are true for the iron of a transformer.

(At 100 complete periods a second.)

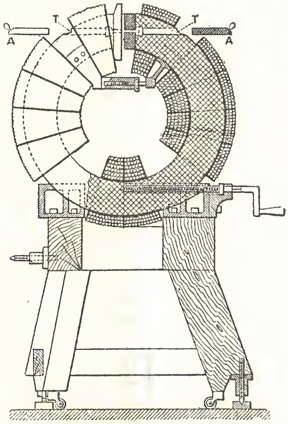
Lines of force in iron.	Volts per ton of iron.	Horse-power wasted in heat per ton of iron.
2,000	650	.87
3,000	1,100	1.48
4,000	1,650	2.21
5,000	2,250	3.02
6,000	2,900	3.89
7,000	3,750	5.03
8,000	4,450	5.97
9,000	5,550	7.43
10,000	6,650	8.90

This phenomenon called hysteresis will have such an effect upon the iron that only after the magnetizing force has been partially removed the influence steals over the iron and develops lines of force. A difference of phase, therefore, exists between the magnetizing force and the lines of force produced, or what might be called the resultant magnetization. The other effect acting upon the iron is much simpler in its nature. It is due to *eddy* currents, small whirling currents induced in the iron by the fact that lines of force are cutting it, passing and repassing so rapidly that an electromotive force is set up and necessarily a current. To avoid these eddy currents the iron is subdivided into thin sheets or used in the form of wire. This treatment will not in the least reduce the hysteresis, as that is entirely due to the molecular condition of the iron, but will reduce the eddies by insulating the parts of the metal from each other. The currents then produced have so short a circuit to flow in that their



CURVE OF THE MAGNETIZATION IN WROUGHT IRON.

volume is very slight and the heat very little. The hysteresis in iron depends upon the extent to which it is magnetized and naturally upon the rapidity with which these changes occur. These, in addition to the fact that it likewise depends upon the quality of the iron, enable us to reduce or increase it at will or hold it well in check.



DEVICE FOR PRODUCING INTENSE MAGNETIC FIELDS.

The importance of understanding these effects and their causes is clearly seen in the design of a transformer. A *transformer* is a device by means of which a given electromotive force can be increased or decreased.

There are two classes of transformers :

Step-up transformers,
Step-down transformers.

In city circuits the step-down transformer is generally used. A pressure varying from 1,000 to 2,000 volts is applied to it and reduced down for purposes of light or power to 50 or 100 volts as required. The transformer consists of a frame of iron upon which are placed two coils of wire. The coils link in with a complete magnetic circuit formed by the iron. The iron is generally used in thin plates and the two coils thoroughly insulated from it and each other are linked by it. Thus, there may be a circle of iron and a coil on each side of it at the opposite extremities of a diameter. The resistance and turns of each coil are duly proportioned to receive and give individually the proper current and pressure.

The iron being continually subject to violent reversals, must create the least possible heat and absorb little or no power. To do this both the hysteresis and eddy currents must be kept down to a certain low but definite value.

OPACITY IN GLASS.

An interesting note on the cause of opacity in opaque glass is communicated by Prof. F. Knapp to a recent number of "Illustriertes Fachblatt," Phosphate of calcium plays an important role as a constituent of certain kinds of opaque glass. Mixed with 13% of phosphate of calcium and upwards to 20% melts to a clear, liquid glass which, when worked rapidly, also cools to a transparent glass. But if the glass be now reheated it becomes white and opaque. When examined under the microscope it has the appearance of a finely divided precipitate in the glass, the particles being so fine that no definite form is shown under the microscope. If the glass is allowed to cool gradually for 24 hours, crystals separate out of the glass either attended or unaccompanied by the milky appearance produced by reheating, as above described. These will dissolve in hydrochloric acid, and when thus dissolved and analyzed are found to consist of phosphate of calcium. In a similar manner, oxide of tin is used to produce opaque enamels. This compound is one of those readily absorbed by glass in the smelting. It acts in a manner similar to the phosphate of calcium. Glass with 7% and upwards to 20% of oxide of tin remains transparent when cooled and worked rapidly, but when slowly cooled it becomes opaque, and under the microscope it shows long needle-shaped crystals. These are not attacked by hydrofluoric acid and consequently can be separated from the glass surrounding them. When subject to analysis they are found to consist of pure oxide of tin. Ordinary transparent glass itself also presents similar phenomena. When melted and worked in the ordinary way it cools down to a transparent amorphous mass, homogeneous throughout. But when the glass is allowed to stand in the molten condition too long, or is allowed to cool down very slowly, it will also become opaque, or show the crystals separated out of the glass made intentionally opaque. This tendency is more or less marked as the composition of the glass is more or less favorable to the retaining of the substances in the solution in the glass.—American Manufacturer.

HOW MUCH SILVER CAN WE COIN?

The Superintendent of the Philadelphia Mint has made an important statement to the effect that if a free silver coinage law should be enacted at this time it could not be enforced. He points out that it would be a physical impossibility for the government to coin the silver which under the provisions of such a law would be dumped into the mints. The government vaults, now contain 200,000,000 ounces of silver bullion, and at the present minting capacity it would require five or more years to coin this into money before an ounce of the bullion which would be poured in under a free silver law could be touched. The Superintendent claims that ten years would be required to increase the capacity of the mint, during which time bullion would be accumulating in such quantities that the mints would never be able to use it up. The answer of the average silverite may be anticipated. He wants the government to provide storage for vast accumulations of bullion, and then issue silver certificates to the coinage value of the bullion, at a ratio of 16 to 1. Really he does not want silver at all. In fact, he would rather not have it. He wants paper.—American Manufacturer.

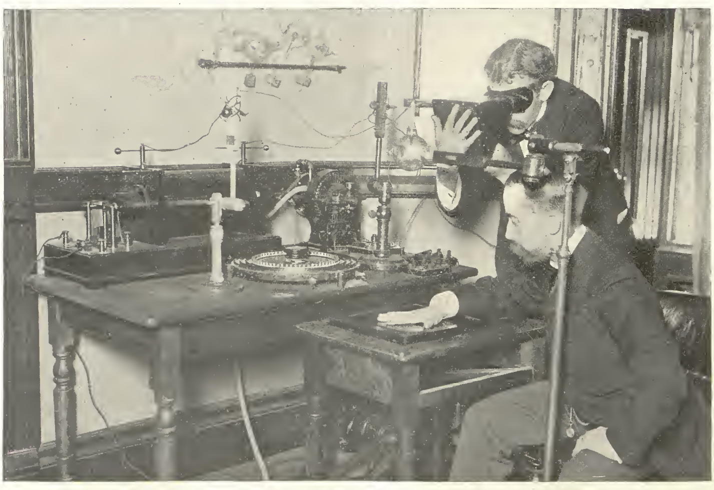
THE APPLICATION OF ROENTGEN RAYS.

The medical fraternity now consider the use of X-rays indispensable for the rapid and correct location of fractures, bullets and other foreign bodies. It is not only applied in the examination of bones, but in the diagnosis of diseases affecting organs entirely hidden from the eye. Deap-seated troubles have been thus brought into sight, and a remedial treatment otherwise impossible frequently successfully adopted.

Deformities and ossifications of all descriptions are readily identified and characterized by all the well-known attendant peculiarities seen until recently only in the dissected form, but now exposed to the actual gaze while clothed with living flesh.

To prodnce these remarkable rays the following apparatus is required :

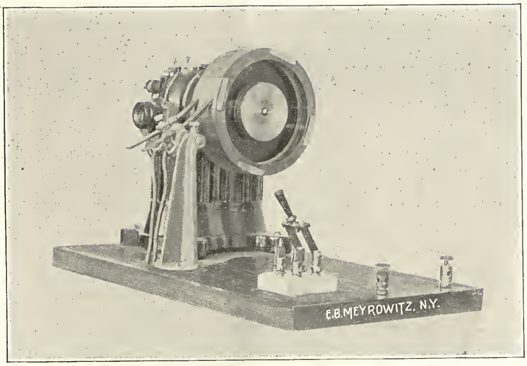
(1). A Crookes tube.
(2). Ruhmkorff induction coil.
(3). Edison fluoroscope or fluorescent screen.



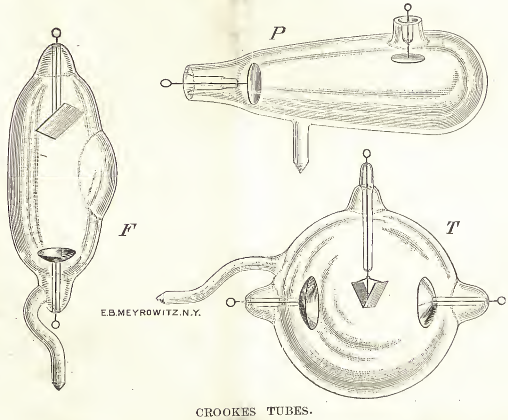
DR. WM. J. MORTON TAKING X-RAY PICTURES IN HIS LABORATORY.

(4). A source of electric current.

The Crookes Tubes which are used to generate these rays are so named after Sir William Crookes, F.R.S., who constructed them for his famous experiments in radiant matter. In these tubes the air has been exhausted to such a degree that the remaining particles have a vastly greater freedom of movement than when under usual atmospheric pressure. Under these circumstances, on leading a powerful electric force into the tube by means of its sealed-in electrodes, these air particles are thrust to and fro between one of the electrodes and the glass opposite, just as an electric machine causes pith-balls to dance, and by their incessant bombardment cause heat to appear in both metal and glass and also the glass to phosphoresce. It is from the phosphorescent spot on the glass that the X-rays emanate.



CONTACT BREAKER.



CROOKES TUBES.

FLUOROSCOPE.

X-RAY PHOTO OF HAND.

These tubes are made in various shapes—globular, pear-shaped (fig. P) and cylindrical (fig F). The most efficient and latest improvement in this line is the focus tube (fig. F), so called on account of the peculiar construction of the electrodes. The concave electrode is always to be used as the cathode. The cathode rays proceeding from it focus on the platinum sheet, which forms the anode, sending off from the spot on which they focus a powerful stream of X-rays. As this spot is quite small, radiographs made with this tube are always well-defined and may be made in a much shorter time than would have been considered possible at an earlier period.

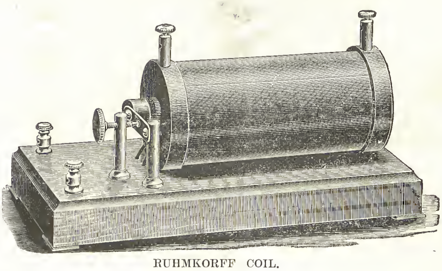
Fig. T represents a Thompson double focus tube having two cathode electrodes, the rays from which are projected simultaneously against the V-shaped anodes placed between them, and give a very brilliant fluorescence.

The Induction Coils used are commonly known as the Ruhmkorff coil, being named after Ruhmkorff of Paris, who, though not the inventor of the same, made many instruments of the kind, and contrived various improvements. One of the most important factors in the production of the X-ray is a perfect working induction coil, as upon its action depends the satisfactory fluorescence of the vacuum tube. The efficiency of the coil depends fluorescing power under the influence of the X-rays, as compared with barium platino-cyanide.

By placing the object to be observed, such as the hand, between the vacuum tube and the fluorescent screen, the shadow is formed on the latter and can be observed at leisure.

The fluorescent screens are made for use in public exhibitions, as they permit more than one person to observe the X-ray picture at the same time in a darkened room. They are mounted in wooden frames with protecting glass over the tungstate of calcium, and can be either stood upon a table or suspended before the tube. The materials are the same as those used in the fluoroscope.

As has been previously stated, various methods of generating the electric current for the production of the X-rays may be employed, namely: primary batteries, storage batteries, or the direct incandescent current, each working equally satisfactory, but requiring more or less accessory apparatus to add to their general efficiency. The least expensive form is to use primary batteries, and any good set of cells giving the voltage required to operate the coil will answer, although we would recommend the Edison-Laland battery, type S, eight cells of which give about 5.3 volts, the average voltage required by 4 to 6-inch coils.



RUHMKORFF COIL.

principally upon the *insulation of the secondary*, which is the most vital part of the coil, a break in this section rendering it practically useless. To overcome any possibility of internal sparking into the primary, or a tendency to spark from the coil to outside objects, a special insulating material is used in the winding of the coil. The base of the coil contains a condenser suitable to the sparking capacity of the coil, and a disconnecting switch and pole-changer.

The make and break apparatus is designed to take the place of the vibrator of the coil, and by reason of its rapid revolutions, produce as nearly a continuous fluorescence as it is possible to make. With it the finest results are obtained, both in radiography and fluoroscopic exhibitions, and it should be employed on all coils of over 5-inch spark, as it reduces the wear on the coil to an appreciable extent, and is much more satisfactory than the vibrator for continuous service. The wheel is made of solid brass with four slate interruptions; the brushes are set on an independent arm and can be adjusted over the surface of the wheel so that it will not wear in one place.

The motor operating the wheel is adjustable to two speeds, and can be regulated to give the best results with the current used.

The entire apparatus is mounted on a polished oak base, and separate switches are provided so that the motor may be started first and obtain headway before turning the current into the brushes and coil.

The Fluoroscope designed by Mr. Edison consists of a flaring box, curved at one end to fit over the forehead and eyes like a stereoscope. The end of the box is closed by a pasteboard cover, on the inside of which is spread a layer of tungstate of calcium, which material Mr. Edison reports he has found to possess six times the

With these cells, the outfit consists simply of the tube, coil, fluoroscope or screen, and batteries, the electromotive force of the cells making it safe to use the vibrator of the coil without injury or detriment to the same, while the single condenser in the base of the coil has sufficient microfarad capacity to give a good fluorescence; a more steady discharge is obtained by the employment of an additional adjustable multiple condenser of at least 2.5 microfarads.

Similar results are obtained by four storage cells, giving eight volts, the difference between the two types of batteries being that the storage cells can be kept operative by being recharged at stated periods at any electric light station, while in the primary cells, the entire elements are consumed and have to be replaced. The use of storage cells also permit the employment of a make and break wheel operated by a motor, which takes the place of the vibrator on the coil, and reduces the wear to a maximum and gives the most perfect fluorescence in the tube. Two additional storage cells are required to operate the motor.

A very excellent volume on the subject of X-rays, written by Dr. Morton, as well as an outfit as described, can be obtained of E. B. Meyrowitz, optician, 104 East 23d Street, N. Y.

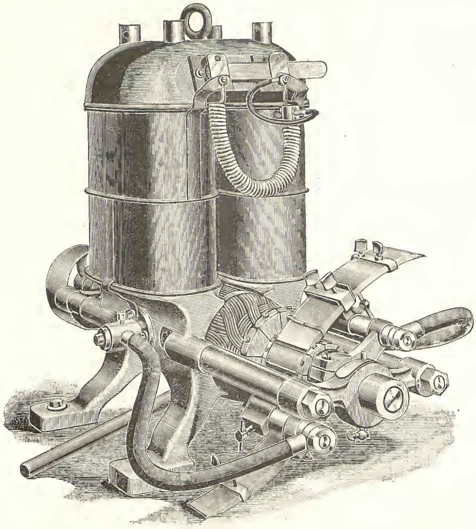
THE WORLD DYNAMO.

The World dynamo is the invention of Mr. Herman Boissier, general manager and electrician of the Arnoux & Hochhausen Electric Company, Nos. 478 and 480 Pearl street, New York. The main features of this plater are high efficiency, absence of heat and perfect regulation. It is shunt-wound and carefully protected and insulated. For electrotypers' use this machine cannot be equalled; it has large bearings, an automatic oiler and a great commutator surface. It produces a good shell of

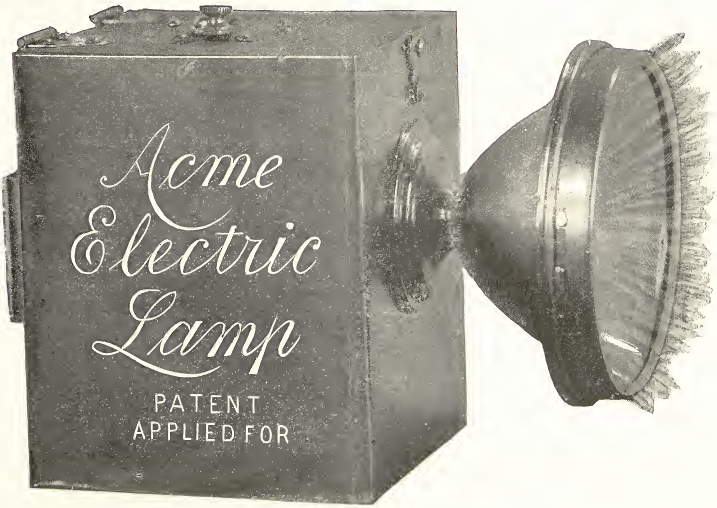
metal in one-half hour. This machine is the result of Mr. Boissier's ideas and represents the product of 16 years' experience in this particular department of electricity.

THE ACME ELECTRIC BICYCLE LAMP.

The problem of a perfect bicycle lamp has been solved and the oil lantern has been relegated to the past. It is not necessary to allude to the many disadvantages to the rider who uses oil, naphtha, taper, or any form of liquid electric light; they are too apparent and familiar to be recounted here, and the mere fact that the riding public is now offered an electric light that no jar or concussion will extinguish, from which no heat or odors arise, and does not contain a chemical to injure the most delicate fabric, or in other words is aboslutely dry, which can be controlled without dismounting, that is so simple in its construction that a knowledge of electricity is not required, and which is guaranteed for eight, and, with economical use, will last for ten hours, needs no further comment to commend it. He who would expect more seeks the impossible, and "the light that never fails" is not for him. Call on the Acme Electric Lamp Co., No. 1659 Broadway, between 51st and 52d streets, and see the best made.



THE WORLD DYNAMO.

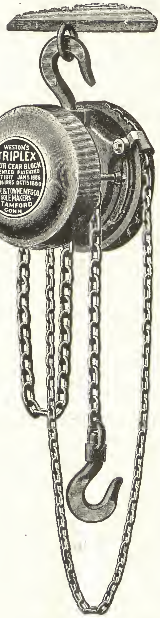


ACME BICYCLE LAMP.

YALE & TOWNE'S CHAIN BLOCKS.

The usefulness of a chain block is almost too well known to need further mention. Because of their value to machine shops and all places where heavy objects are to be moved, certain types have been put upon the market of suitable design, constructed with the object of meeting special circumstances successfully. As we obtain leverage by means of a long arm resting on a fulcrum, so likewise do we gain by the use of a rope or chain device in which this principle of supplying speed for power is kept in view. This point is given expression to by the word "velocity-ratio." It determines the differences between chain blocks by establishing a ratio between the number of feet of chain required to lift the weight one foot in one block and another.

The Yale & Towne people have treated this subject in a scientific manner and obtained results that are of great commercial value; so great, in fact, that chain blocks made by them are correct in every detail and of high efficiency. "The triplex block" shown in the cut obtains its power through a train of spur gearing, and hence has a higher efficiency than any other similar device invented.



YALE WESTON TRIPLEX BLOCK.

By writing to the general offices of the Yale & Towne Manufacturing Co., No. 280 Broadway, New York, catalogues and prices can be obtained and the attention of a firm willing and anxious to please.

SILVER TURNED INTO GOLD.

Dr. Stephen H. Emmens, of New York City, announces that he has discovered a process by which he can transmute silver into gold. "Gold," said he, "is universally believed to be practically indissoluble, but we have found a way to dissolve it, as sugar dissolves in water. I cannot make public now the processes which we propose to employ. We already see our way to practical success. We have discovered a satisfactory method of varying molecular density, and what remains to be done is to control the time factor of the process. By reducing the time we shall reduce the expense of the transmutation, and when it is considered that a cost of even $10 an ounce will leave an enormous profit, it will be seen that we have ample margin at our disposal. There is, accordingly, a serious probability of silver becoming marketable at a greatly enhanced price. When it is known to be in reality a form of gold, or, rather, a raw material from which gold can be produced, its intrinsic value will be that of gold, after allowance is made for the cost of conversion and for such profit as the patentees of the process may consider reasonable."

"But you will spoil a political issue if you succeed," interrupted a New York "Press" reported, inadvertently.

"Oh, yes," said Dr. Emmens, indifferently. "This discovery is a feature that the ardent political combatants of the day may have to take into account. Othello's occupation will be gone, indeed, if the rivalry between gold and silver should disappear. The success of our efforts will mean a permanent settlement of the great question of 'gold versus silver.'"

The Soldering of Glass.—Margot has been making some very interesting investigations upon the subject of the soldering of glass, and has established the fact that an alloy composed of 95 parts of tin and 5 parts of zinc will melt at 200° C., becoming firmly adherent to the glass, is unalterable, and exhibits an attractive metallic luster. An alloy containing 90 parts of tin and 10 parts of aluminium will melt at 390° C., and also forms a very strong solder for glass, being likewise possessed of a very stable brilliancy. With these two alloys always ready to hand, we may claim to have discovered a means of soldering glass as easily as soldering any two pieces of metal, and the operation is easily performed. When the glass is heated in a furnace the soldering can be accomplished by rubbing the surface with a rod of either of the above named solders. The alloy as it flows can be evenly distributed with a tampoon of paper or a strip of aluminium, or with an ordinary soldering iron.—Invention.

POSSIBLE CONTRACTS.

New York City.—William B. Franke, of No. 217 West 125th street, is building two 7-story fireproof apartment houses, to cost $150,000, at the northeast corner of West End avenue and 79th street.

Trenton, N. J.—A syndicate of New York and Philadelphia capitalists has been formed to construct an electric railway between New York and Philadelphia. The capital stock of the New York & Philadelphia Traction Company is $10,000,000. There will be nearly one thousand miles of road connecting the principal towns of New Jersey. Work upon the new road is to be commenced in a few days. A contract has just been given out for operations between New Brunswick and Bound Brook and Raritan and Dunellen, which will amount to $475,-000. A power house to cost $100,000 is to be erected near Bound Brook.

Brunswick, Ga.—The city is considering the granting of a new electric lighting franchise. Address the Mayor.

Frankfort, Ky.—The sinking fund commissioners of the State Penitentiary have decided to arrange for the erection of a large electric light plant.

Austin, Tex.—L. A. Ellis, W. R. Hanby, Edward Wilson and others have organized a company to build an electric line in the city.

Piedmont, W. Va.—The city contemplates erecting an electric light plant, and is now making investigations regarding it. J. P. Williams, Mayor.

Philadelphia, Pa.—Work has been started by Patrick O'Meara on a 5-story brick and iron light manufacturing building on the west side of 8th street, next to the south corner of Sansom street.——The Cathedral is to be illuminated with incandescent lamps. More than 700 will be distributed through the cathedral proper, in and about the dome, transept, nave and other portions of the interior. The parochial school will have 100 lights, as will also the Archbishop's residence; the convent will have 40 additional ones and the chapel 75. The illumination, it is said, will cost between $4,000 and $5,000.—Contractors R. S. Ballinger & Co. began to-day to make additions and alterations to the Heed Building, Nos. 1213 and 1215 Filbert street, to cost $21,000. The present structure is now six stories in height, and two additional stories are to be put on the building.——Charles L. Pierson will begin the erection of a store and two dwellings, a stable and a grain elevator at Broad and Huntington streets. The dwellings will cost $6,500 each; the elevator will cost $34,000. A. C. Wagner, architect, prepared the plans.

Norristown, Pa.—Mr. Bean is making plans for extensive alterations and additions to the Windsor Hotel, of this place, Samuel Minch proprietor. An electric light plant will be introduced and elevators constructed.

TELEPHONE NOTES.

Easton, Md.—The Union Telephone Company, of this place, M. M. Higgins, manager, wants bids on constructing its entire system (about 75 subscribers), with or without telephones, company to furnish poles and possibly telephones and switchboards.

Fulton, N. Y.—At the regular meeting of the Board of Trustees held Tuesday evening a franchise was granted John H. Drake and Geo. S. Stitch to place a telephone plant in the village. Work will commence as soon as they have 50 subscribers.

Chattanooga, Tenn.—A franchise for establishing a telephone system has been applied for by the People's Telephone Company of Knoxville, Tenn.

Auburn, N. Y.—A scheme is on foot to establish another telephone plant in Auburn. Representatives of out-of-town capitalists are expected to arrive early next week to look over the ground.

NEW CORPORATIONS.

Chicago, Ill.—Glen Ellyn & Lombard Electric Light & Power Company has been incorporated at Glen Ellyn. Capital stock, $20,000. Incorporators, Thomas Gibson, Joseph L. Gibson, and Charles F. McElroy.——United States Motor Company, incorporated, Chicago. Capital stock, $2,500; to manufacture motors. Incorporators, Charles E. Burnah, Horace E. Wells and M. A. Wells.

Kalamazoo, Mich.—The Kalamazoo Light, Heat & Power Company has been incorporated, with a capital stock of $200,000.

NEW TELEPHONE COMPANIES.

Webbville, Ky.—The Webbville & Blaine Telephone Company has been incorporated; B. F. Webb, president; J. W. Ratcliff, secretary, and F. H. Moore, treasurer. Capital stock, $600; to construct a telephone system.

Aiken, S.C.—The Carolina Telephone Exchange Company has been incorporated, with a capital stock of $10,-000, to establish telephone systems in South Carolina. C. K. Henderson is president; James Powell, vice-president and secretary; and W. J. Platt, treasurer.

Chattanooga, Tenn.—An application was filed for a charter for the Chattanooga Telephone Company. The incorporators are: J. C. Duncan, Xen Wheeler, T. H. Payne, Thomas McDermott, D. P. Montague and W. I. Crandall. In the application for charter the incorporators state that it is their intention to establish a thoroughly equipped telephone system in that city.

Muskegon, Mich.—The Citizen's Telephone Company has been incorporated. Capital stock, $18,000.

Detroit, Mich.—The Detroit Telephone Construction Company has been incorporated with a capital stock of $250,000.

TELEPHONE PATENTS.

Issued July 21, 1896.

564,196. Telephone. Edmund A. Hinckley, Owego, N. Y. Filed Nov. 11, 1895.

564,328. Telephone Exchange System. William W. Dean, St. Louis, Mo. Filed April 10, 1896.

564,456. Operator's Keyboard Apparatus and Circuit Therefor. Charles E. Scribner, Chicago, and Frank R. McBerty, Downer's Grove, Ill. Filed Sept. 28, 1893.

564,457. Operator's Keyboard Apparatus and Circuit Therefor. Charles E. Scribner, Chicago, and Frank R. McBerty, Downer's Grove, Ill. Filed Jan. 10, 1894.

564,458. Keyboard Apparatus for Telephone Switchboards. Charles E. Scribner, Chicago, Ill. Filed May 14, 1894.

Issued July 28, 1896.

564,745. Telephone System. Claude C. Gould, Philadelphia, Pa. Filed July 5, 1895.

ELECTRICAL and STREET RAILWAY PATENTS.

Issued July 21, 1896.

564,182. Electric Igniter for Gas Engines. Louis M. Bourgeois, Jr., New Orleans, La. Filed June 7, 1895.

564,195. Electric Car Brake. John C. Henry, Colorado Springs, Colo. Filed July 15, 1895.

564,200. Alternating Current Dynamo. Maurice Hutin and Maurice Leblanc, Paris, France. Filed May 10, 1894. Patented in France Jan. 6, 1893; in England, June 24, 1893; in Belgium, June 27, 1893; in Switzerland, July 3, 1893; in Italy, Aug. 24, 1893, and in Spain, Feb. 9, 1894.

564,229. Automatic Fire Alarm System. Edwin A. Speer, Toledo, O. Filed May 3, 1895.
564,243. Rail Bond for Electric Railway. Fred H. Daniels, Worcester, Mass. Filed June 15, 1895.
564,262. Electrical Transportation System. Philip K. Stern, St. Louis, Mo. Filed Oct. 7, 1895.
564,283. Electric Switch. John T. Hunt, New York, N. Y. Filed May 12, 1896.
564,296. Magnetic Chuck. Oakley S. Walker, Worcester, Mass. Filed Feb. 13, 1896.
564,314. Anunciator. John B. Rogers, Zillah, Wash. Filed Oct. 31, 1894.
564,331. Electric Metal Working Apparatus. Hermann Lemp, Lynn, Mass. Filed June 15, 1891.
564,333. Means for Generating Electricity from Car-Wheel Axles. Morris Moskowitz, Newark, N. J. Filed Nov. 1, 1895.
564,334. Means for Generating Electricity from Car Wheels. Morris Moskowitz, Newark, N. J. Filed Mar. 14, 1896.
564,335. Means for Generating Electricity from Car-Wheel Axles. Morris Moskowitz, Newark, N. J. Filed Mar. 14, 1896.
564,336. Means for Generating Electricity from Car-Wheel Axles. Morris Moskowitz, Newark, N. J. Filed April 23, 1896.
564,344. Electric Signal Apparatus for Elevators. Samuel C. Stickle, New York, N. Y. Filed Aug. 4, 1894.
564,369. Elevated Electric Railway. Edward W. Farnham, La Grange, Ill. Filed Oct. 14, 1892.
564,395. Electric Car Trolley. William H. Russell, Newcastle, Can. Filed Oct. 31, 1895.
564,437. Electric Blasting Machine. James Macbeth, Brooklyn, N. Y. Filed Oct. 31, 1895.
564,453. Electric Metal-Working Apparatus. Elias E. Ries, Baltimore, Md. Filed May 1, 1891.
564,455. Electric Motor. Gordon J. Scott, Philadelphia, Pa. Filed Sept. 19, 1895.
564,480. Electric Elevator. George T. Francis, Chicago, Ill. Filed April 20, 1896.
564,485. Electric Mat. Oliver H. Hicks, Chicago, Ill. Filed Nov. 29, 1895.
564,527. Conduit Outlet Box for Electric Wires. Charles A. Mezger, Brooklyn, N. Y. Filed Jan. 25, 1896.
564,533. Emergency Car Brake and Fender. Charles C. Peck, Middlebury, Vt. Filed Sept. 17, 1895.
564,558. Speed Regulators for Electric Motors. Rudolph Eickemeyer, Yonkers, N. Y. Filed Oct. 6, 1891.
564,559. Dynamo-Electric Machine. Rudolph Eickemeyer, Yonkers, N. Y. Filed Oct. 7, 1891.
564,567. Thermostat. Hosea F. Maxim, Norfolk, Va. Filed Sept. 9, 1895.

New York Notes.

B. W. Payne & Sons, No. 41 Dey street, sold to the U. S. Projectile Company, of South Brooklyn, two 100-HP. direct-connected engines, C. & W. system; one 50-HP. direct-connected to card dynamo, to the Manhattan Rubber Co., of Passaic, N. J. This engine was run at the exhibition and attracted much attention on account of its oiling device and new governor. Two direct-connected engines with General Electric dynamos to George Cressan Company, of Philadelphia, Pa. One 100-HP. direct-connected to C. & C. Electric Company's dynamo of 50-K.-W. for use in Philadelphia. The Philadelphia office have received these orders. Over 15 engines have been sold since May 25, and they are exporting more.

Wm. B. Vandewater, assistant to the general manager of the Interior Conduit & Insulation Company, No. 527 W. 34th street, New York, after a year's close attention to business has been granted a two-weeks' leave of absence. Mr. Vandewater is stopping at Richfield Springs.

Frank Harrington, of the Habishaw Wire Company, has returned to business after a three weeks' vacation. His friends will not know him, he looks so robust and well.

Elmer P. Morris, of the Monarch Paint Company, has just returned from a big Western trip. He is now located at No. 36 Dey street, New York. His friends are welcome; a bottle of paint always open.

Fred Noll, the city representative of the Interior Conduit & Insulation Company, is one of the hardest workers in the trade. He sold 50% of their fan motors this season, the number running up into the thousands. Mr. Noll is one of the most popular men in the trade.

Frank de Ronde, the general manager of the Standard Paint Company, can always be found at his post. He is a very persistent worker and deserves the greatest credit for his efforts in building up the business of this company. He has created the demand for their P. & B. compound among all the leading manufacturers, supply houses, dynamo builders, etc. An armature varnish, greatly used, is of his own composition.

John Hunt, of Zwidars & Hunt, No. 127 5th avenue, New York, the well-known electrical contractors, has recently returned after a trip to Canada.

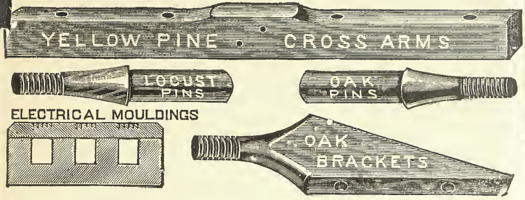
Jack Hatzel, of Hatzel & Buehler, electrical contractors, No. 114 5th avenue, New York, was elected president of the Electrical Contractors' Association last week. His partner has just returned from a pleasant vacation.

J. E. Keelyn, president and general manager of the Western Telephone Construction Co., of Chicago, will be at the Astor House August 24th next. He will close up some large contracts in the east and arrange for some extended business.

W. T. H.

Central Manufacturing Co.,

CHATTANOOGA, MANUFACTURERS AND DEALERS IN TENN.



ELECTRICAL DIRECTORY.

... $3.50 ...

WE WANT 50 subscribers at $3.50 each for a printed copy of our Electrical Directory, containing a complete list of electricians, electrical engineers, dealers in electrical goods, supply houses, manufacturers of dynamos, motors, instruments, etc., in every city in the United States and Canada. Send in your order with name and address, enclosing $3.50, to

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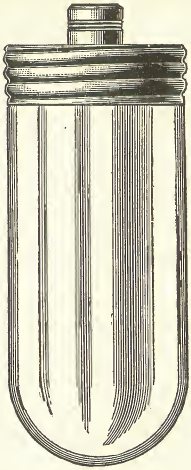
WE MAKE THEM.



E. P. GLEASON MFG. CO.,
181 to 189 Mercer St., New York.

THE WORLD DYNAMO

WILL PRODUCE A SHELL IN 30 MINUTES.

Manufactured by the

ARNOUX & HOCHHAUSEN ELECTRIC CO., 478 & 480 PEARL ST. NEW YORK.

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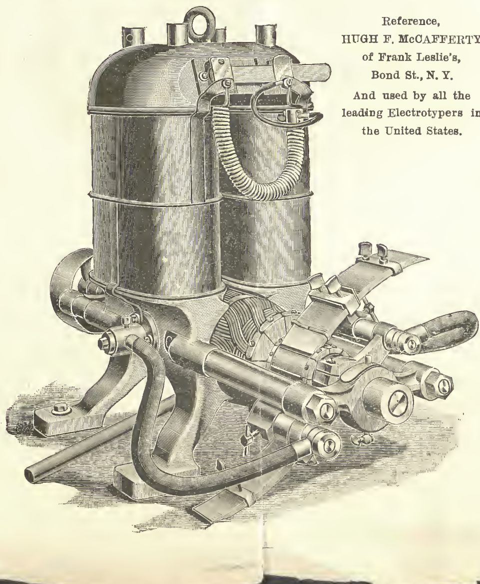
HUGH F. McCAFFERTY
of Frank Leslie's,
Bond St., N. Y.
And used by all the
leading Electrotypers in
the United States.



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